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09/830,645	12/03/2001	Kazunori Fukada	FUKADA1	1868

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EXAMINER
WILKINS III, HARRY D

ART UNIT	PAPER NUMBER
1742	10

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/830,645	Applicant(s) FUKADA, KAZUNORI	
	Examiner Harry D Wilkins, III	Art Unit 1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 June 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 April 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admission of prior art in view of Kojima et al (JP 55-041940) and "Plasma (Ion) Nitriding".

Applicant admits as prior art (see pages 1-3) that air motors have been made having rotors, cylinders and front and rear cylinder covers. There has been a problem of wear of the surface of the members surrounding the vanes. Thus, there was a need for vane-surrounding members for air motors excellent in abrasion resistance.

Applicant's admission of prior art fails to teach the claimed method of imparting the abrasion resistance, i.e.-the nitrosulphurization process.

Kojima et al teach (see pages 3-4 of English translation) a method of nitrosulphurizing a steel member by exposing the member to glow discharge at 400-600°C in an atmosphere of H_2S, NH_3 and at least one of Ar, He and H_2. Kojima et al teach (see English abstract) that the atmosphere contains 25-100 vol% of NH_3, 0.01-5 vol% H_2S and the rest being H_2. Thus, Kojima et al teach an overlapping range of composition for the gas atmosphere, except that Kojima et al teaches NH_3 and the present claims recite N_2. See MPEP 2144.05 I. Kojima et al teach (see last paragraph

on page 7 of English translation) that the method occurs at a pressure of 10^{-1} Torr or less. Kojima et al teach (see paragraph spanning pages 3 and 4 of English translation) that the thickness of the formed surface layer is 3-50 μm.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied the nitrosulphurizing treatment of Kojima et al to the conventional air motor members because the process imparts superior abrasion resistance and self-lubricity to the members.

"Plasma (Ion) Nitriding" teaches the general state of the art of plasma nitriding. Particularly (see page 421, paragraph spanning 1st and 2nd columns) that nitrogen gas is typically used instead of ammonia because nitrogen gas allows for more precise control of the process and the composition of the nitrided case. "Plasma (Ion) Nitriding" teaches (see page 421, 3rd column) that the typical temperature of plasma nitriding is 375-650°C. "Plasma (Ion) Nitriding" teaches (see page 422, paragraph spanning 1st and 2nd columns) that the voltage utilized in plasma nitriding is from 200-1000V.

Therefore, it would have been obvious to one of ordinary skill in the art to have substituted nitrogen gas (N_2) for the ammonia (NH_3) taught by Kojima et al because "Plasma (Ion) Nitriding" teaches that the nitrogen gas provides more precise control of the process and composition of the nitrided case. Because in ion nitriding and ion nitrosulphurizing, the method works by dissociating the individual gas molecules into their respective atoms, one of ordinary skill in the art would have had a reasonable expectation of successfully applying the N_2 gas to the nitrosulphurizing method of

Kojima et al because the source of the N ions for ion nitriding/nitrosulphurizing would not affect the final product.

Regarding the parameter of temperature, it would have been within the expected skill of a routineer in the art to have optimized this value within the disclosed range in order to achieve the best glow-discharge thickness (for support, see "Plasma (Ion) Nitriding" at page 422, paragraph spanning 1st and 2nd columns). Regarding the parameter of DC voltage, it would have been within the expected skill of a routineer in the art to have selected an appropriate voltage to operate at in order to achieve the best glow-discharge thickness (for support, see "Plasma (Ion) Nitriding" at page 422, paragraph spanning 1st and 2nd columns). Changes in temperature, concentrations, or other process conditions of an old process does not impart patentability unless the recited ranges are critical, i.e., they produce a new and unexpected result. In re Aller et al (CCPA 1955) 220 F2d 454, 105 USPQ 233. Only result-effective variables can be optimized. In re Antonie 559 F2d 618, 195 USPQ 6 (CCPA 1977). See MPEP 2144.05 II.

Regarding claim 2, one of ordinary skill in the art would have expected the plasma nitriding of the prior art to have produced a surface hardness of 800-1200 Vickers as can be seen in Figure 8 of "Plasma (Ion) Nitriding".

Regarding claims 3 and 5, Kojima et al teach using a ratio of 5 parts of H_2S to 45 parts of the nitrogen-containing gas (NH_3) (i.e.-when H_2 is 50 vol%, H_2S is 5 vol%, leaving 45 vol% for NH_3). This is a ratio of 11.1 parts by volume H_2S based on 100 parts by volume of the nitrogen-containing gas. Therefore, it would have been obvious

to one of ordinary skill in the art to have maintained the H_2S to nitrogen-containing gas ratio in order to maintain the qualities imparted by the method of Kojima et al when the nitrogen-containing gas was changed to N_2 as per "Plasma (Ion) Nitriding".

Regarding claim 4, Applicant's admission defines the parts that require the improved abrasion resistance as (see page 2, lines 6-12) the vane-surrounding members. The vane-surrounding members are defined (see page 1, lines 2-6) as being the rotor, cylinder and front and rear cylinder covers.

Regarding claim 6, Kojima et al teach (see middle paragraph on page 6 of English translation) using as the base material SCM21 steel. SCM21 steel (now know as SCM415, see "JIS G 4105-1979") was known to be a quench and temper steel (see Takemura et al at col. 10, lines 7-9).

Regarding claim 7, Kojima et al teach (see last paragraph on page 7 of English translation) a broad range for pressure of less than 10^{-1} Torr. "Plasma (Ion) Nitriding" teaches (see paragraph spanning 1st and 2nd cols. on page 422) that pressure affects the nitriding, thus, it would have been within the expected skill of a routineer in the art to have optimized the pressure to achieve the desired ion nitrosulphurizing.

Regarding claim 8, Kojima et al teach (see middle paragraph on page 6 of English translation) nitrosulphurizing for 2 hours.

Regarding claim 9, Kojima et al teach (see page 7 of English translation) that H_2 is suggested as the diluting gas. Kojima et al further teach (see claims 5 and 6) that the H_2S gas is present at 0.01-5 vol% and the NH_3 at 25-100 vol%. Thus, the H_2 content would be up to 75 vol%. While there is no specific example in Kojima et al

describing the ratio of N_2 to H_2, it was known in the prior art (see "Plasma (Ion) Nitriding" at page 423, 1st col.) that the ratio of N to H controls what type of nitride surface layer is formed. Therefore, it would have been within the expected skill of a routineer in the art to have optimized the ratio of N_2 to H_2 to form a suitable surface layer.

Regarding claim 10, Kojima et al teach (see page 7 of English translation) adding one or both of Ar and He in addition to H_2 as the diluting gas.

Regarding claim 11, first, as a matter of interpretation, the recitation "partial pressure" in this claim appears to be equivalent to volume percent and examination will be treated as such. To be a partial pressure, the recitation should include an actual pressure. In addition, relative partial pressures are directly proportional to volume percents. As above, it would have been within the expected skill of a routineer in the art to have optimized the applied voltage in order to achieve the best glow-discharge thickness (for support, see "Plasma (Ion) Nitriding" at page 422, paragraph spanning 1st and 2nd columns). Kojima et al fails to meet the presently claimed atmospheric composition range, by teaching 0.01-5 vol% H_2S, 25-100 vol% NH_3 and less than 75 vol% H_2. However, when the N:H ratio (a known result effective variable as described above) is converted for using N_2 instead of NH_3, the presently claimed composition is within the range of Kojima et al (80 H_2, 5 H_2S and 15 N_2 would be equivalent to 51.153 H_2, 43.846 NH_3 and 5 H_2S). Therefore, it would have been within the expected skill of a routineer in the art to have optimized the composition of the treatment atmosphere to achieve the best surface layer conditions possible.

Regarding claim 12, "Plasma (Ion) Nitriding" discusses the general ion nitriding process at page 421, 2nd col. to page 422, 2nd col.. The general procedure includes evacuation and heating to nitriding temperature and then adding the process gases followed by cooling. It would have been within the expected skill of a routineer in the art to have optimized the heating temperature, the atmosphere composition (as discussed above) and the duration of the treatment and the cooling conditions.

3. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admission of prior art in view of Kojima et al (JP 55-041940) and "Plasma (Ion) Nitriding" as applied above to claims 1-12 and further in view of Kramer et al (US 3,767,335).

As discussed above in paragraph no. 2, Applicant's admission of prior art in view of Kojima et al and "Plasma (Ion) Nitriding" disclose the invention substantially as claimed.

However, Applicant's admission of prior art does not expressly disclose the air motor as claimed.

Kramer et al teach (see figure 1 and col. 2, lines 3-20) an air motor with a rotor supported by bearings and surrounded by a cylinder with a partial annular space as claimed. Though there is no express disclosure of front and back covers, such would exist to close the motor to allow for operation. Also, while there is no express disclosure of means for feeding and exhausting air from the "space", such would exist to allow for operation of the air motor.

Therefore, it would have been obvious to have applied the method of Kojima et al in view of "Plasma (Ion) Nitriding" to the inner surface of the cylinder of Kramer et al because the nitrosulphurizing improves the wear resistance of the surface.

Response to Arguments

4. Applicant's arguments filed 6 June 2003 have been fully considered but they are not persuasive. Applicant argued that:

a. Kojima et al teach forming a surface layer with thickness of only 15 μm;

b. The prior art does not recognize the problem addressed by the present invention; and,

c. It would not have been obvious to substitute N_2 for the NH_3 in the method of Kojima et al.

In response to Applicant's first argument, as stated above, Kojima et al teach that the thickness of the surface layer is from 3-50 μm.

In response to Applicant's second argument, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

In response to Applicant's third argument, because of how plasma nitriding works, the nitrogen source (N_2 in "Plasma (Ion) Nitriding" and NH_3 in Kojima et al) and other gases are ionized into their constituents atoms/ions. Thus, once the ionization has begun, it would not make a difference as to whether the N ions came from an N_2

molecule or from an NH_3 molecule. Therefore, one of ordinary skill in the art would have expected a reasonable chance of successfully applying N_2 to the nitrosulphurization method and would have been motivated to do so because of the increased control of nitriding potential offered by using N_2.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 703-305-9927. The examiner can normally be reached on M-Th 10:00am-8:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 703-308-1146. The fax phone numbers for

the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Harry D Wilkins, III
Examiner
Art Unit 1742

ROY KING
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

hdw
July 16, 2003